LinMot®



E1200 Servo Drive
Installation Guide

Eine Deutsche Version kann unter http://www.linmot.com bezogen werden!
Please visit http://www.linmot.com to check for the latest version of this document!

This document applies to the following drives:

E1200-GP-UC	E1230-DP-UC
E1250-PL-UC	E1250-EC-UC
E1250-SE-UC	E1250-PN-UC
E1250-IP-UC	E1250-SC-UC

The information in this documentation reflects the stage of development at the time of press and is therefore without obligation.
NTI AG reserves itself the right to make changes at any time and without notice to reflect further technical advance or product improvement.

Document version 5.2a/ mk/Ro/FM, December 2013

Table of Content

1 Important Safety Notes for E1200 Series Drives

C A U T I O N !

In order to assure a safe and error free operation, and to avoid severe damage to system components, all system components must be directly attached to a single ground bus that is earth or utility grounded (see chapter 5 Power Supply and Grounding).

Each system component should be tied directly to the ground bus (star pattern), rather than daisy chaining from component to component. (LinMot motors are properly grounded through their power cables when connected to LinMot drives) (see chapter 5 Power Supply and Grounding).

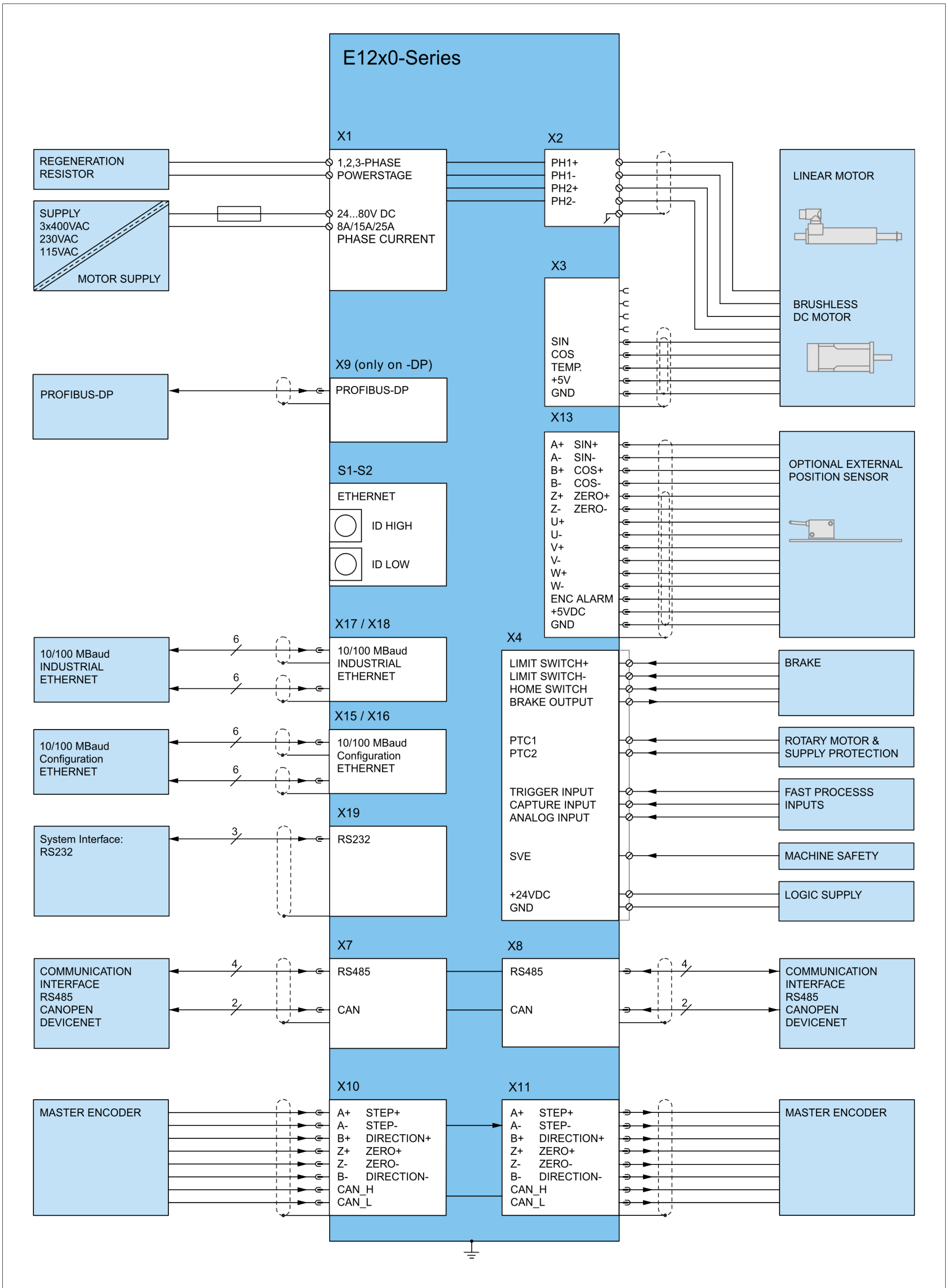
All connectors <u>must not be connected or disconnected</u> while DC voltage is present. Do not disconnect system components until all LinMot drive LEDs have turned off. (Capacitors in the power supply may not fully discharge for several minutes after input voltage has been disconnected). Failure to observe these precautions may result in severe damage to electronic components in LinMot motors and/or drives.

<u>Do not switch Power Supply DC Voltage.</u> All power supply switching and E-Stop breaks should be done to the AC supply voltage of the power supply.

<u>Do not connect or disconnect the motors from drives</u> with voltage present. Wait to connect or disconnect motors until all LinMot drives LEDs have turned off. (Capacitors may not fully discharge for several minutes after power has been turned off).

Failure to observe these precautions may result in severe damage to electronic components in LinMot motors and/or drives.

2 System Overview



Typical servo system E12x0-XX: Servo drive, linear motor and power supply.

3 Functionality and Interfaces

	E1250-PL-UC	E1250-PN-UC	E1250-SC-UC	E1250-IP-UC	E1250-EC-UC	E1250-SE-UC	E1230-DP-UC	E1200-GP-UC
Supply Voltage								
Motor Supply 72VDC (24...85VDC)	•	•	•	•	•	•	•	•
Logic Supply 24VDC (22...26VDC)	•	•	•	•	•	•	•	•
Motor Phase Current								
32A $_{peak}$ / 12A $_{rms}$	•	•	•	•	•	•	•	•
Controllable Motors								
LinMot P01-23x… (Motor Link P)*	•	•	•	•	•	•	•	•
P01-37x… (Motor Link P)*	•	•	•	•	•	•	•	•
P01-48x… (Motor Link P)*	•	•	•	•	•	•	•	•
DC Motors	•	•	•	•	•	•	•	•
Brushless DC / EC Motors	•	•	•	•	•	•	•	•
Command Interface								
CANopen	•	•	•	•	•	•	•	•
LinRS	•	•	•	•	•	•	•	•
POWERLINK	•							
PROFINET		•						
sercos			•					
Sercos over EtherCAT					•	•		
ETHERNET IP				•				
EtherCAT					•	•		
PROFIBUS-DP							•	
Programmable Motion Profiles (Curves)								
Up to 100 Motion Profiles	•	•	•	•	•	•	•	•
Programmable Command Table								
Command Table with up to 255 entries	•	•	•	•	•	•	•	•
External Position Sensor								
Incremental (RS422 up to 25 M counts/s, quadrature ev.)	•	•	•	•	•	•	•	•
Synchronisation								
Master Encoder In/Out (RS422 up to 25 M counts/s, quadrature ev.)	•	•	•	•	•	•	•	•
Configuration Interface								
RS232	•	•	•	•	•	•	•	•
Ethernet 10/100 Mbit/s (2-Port Switch integrated)	•	•	•	•	•	•	•	•

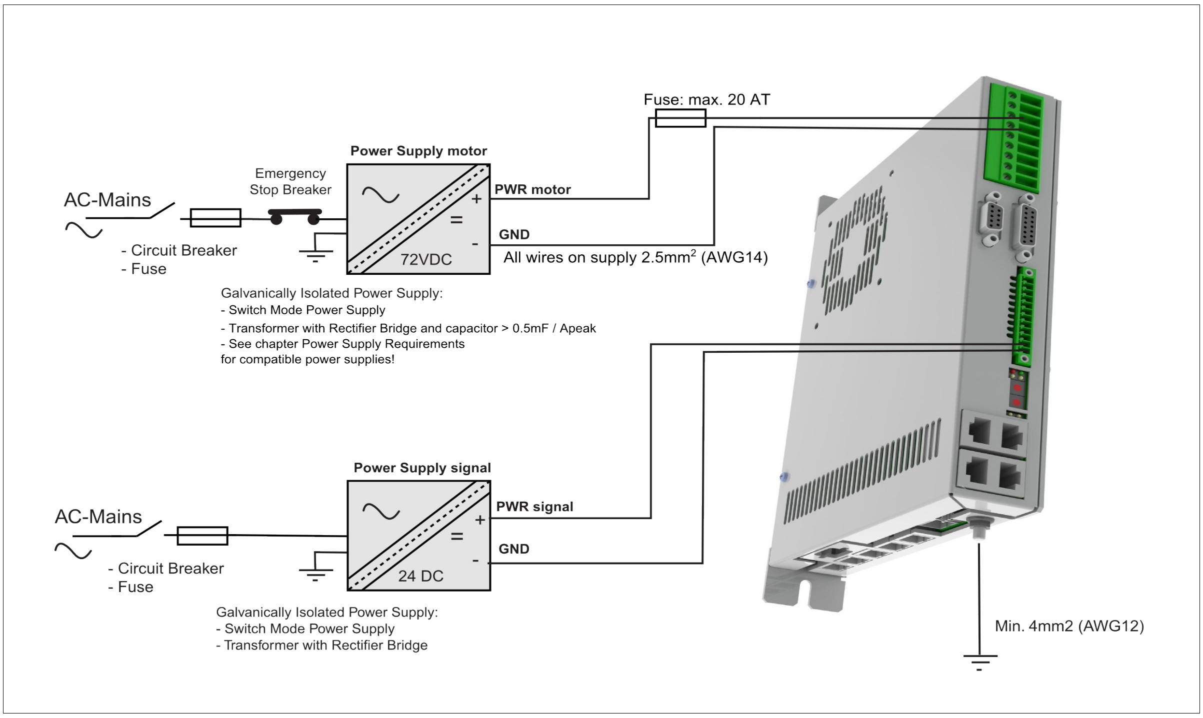
4 IP Address Selection

The default mode for acquiring an IP address is via DHCP. If no servers respond on the connected network, the drive switches to the Ipv4 Link-Local addressing scheme (also known as APIPA on Windows systems). This way the drive automatically assigns itself an address within the range of 169.254.0.1 through 169.254.255.254 (Subnet Mask 255.255.0.0).

Please note that this process can take up to a minute until a valid address is assigned to the drive.

* LinMot Motor Communication

5 Power Supply and Grounding





In order to assure a safe and error free operation, and to avoid severe damage to system components, all system components* must be well grounded to either a single earth or utility ground. This includes both LinMot and all other control system components on the same ground bus.



Each system component* should be tied directly to the ground bus **(star pattern)**, rather than daisy chaining from component to component. (LinMot motors are properly grounded through their power cables when connected to LinMot drives.)



Power supply connectors must not be connected or disconnected while DC voltage is present. Do not disconnect system components until all LinMot drive LEDs have turned off. (Capacitors in the power supply may not fully discharge for several minutes after input voltage has been disconnected). Failure to observe these precautions may result in severe damage to electronic components in LinMot motors and/or drives.



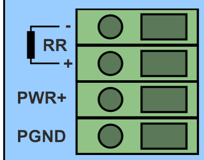
Do not switch Power Supply DC Voltage. All power supply switching and E-Stop breaks should be done to the AC supply voltage of the power supply. Failure to observe these precautions may result in severe damage to the drive.

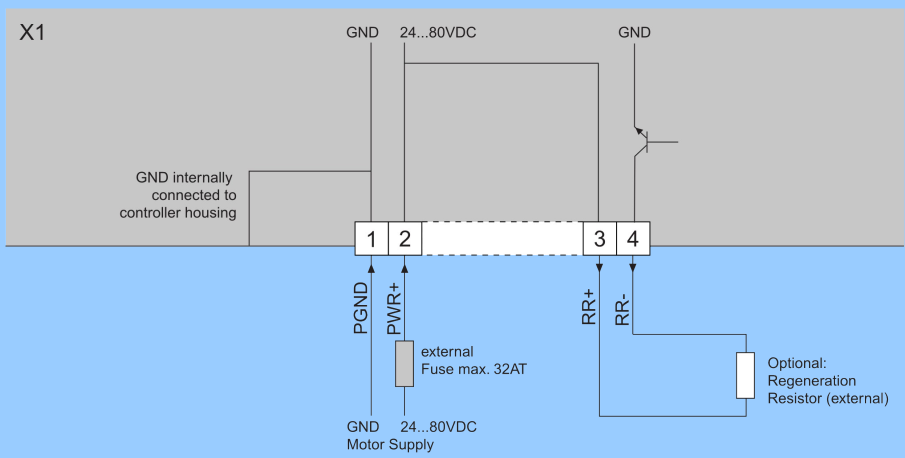
* Inside of the E1200 drive the *PWR motor GND* and *PWR signal GND* is connected together and to the GND of the drive housing. It is recommended that the *PWR motor GND* is NOT grounded at another place than inside of the drive to reduce circular currents.

6 Description of the connectors / Interfaces

6.1 X1

X1 **Motor Supply / Regeneration Resistor**





Screw Terminals

External Regeneration Resistor (RR01-10/60, Art. Nr. 0150-3088)

External Fuse: max. 32AT (for example RK5 Class Fuse Bussmann FRN-R-30)

Supply nominal 72VDC (24...85VDC / 30..85VDC for UL compliance)
(See chapter Power Supply Requirements for compatible power supplies.)

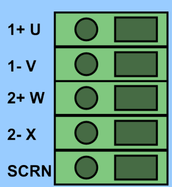
Absolute max. Rating 72VDC +20%.

If motor supply voltage is exceeds 90VDC, the drive will go into error state.

- Tightening torque: 0.5 - 0.6 Nm
- Screw thread: M2.5
- Use 60/75°C copper conductors only
- Conductor cross-section: use only 2.5mm^2 / AWG 14
- Stripping length: 13-15mm
- Max. length: 4m

6.2 X2

X2 **Motor Phases**

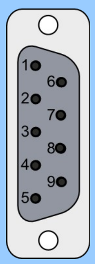
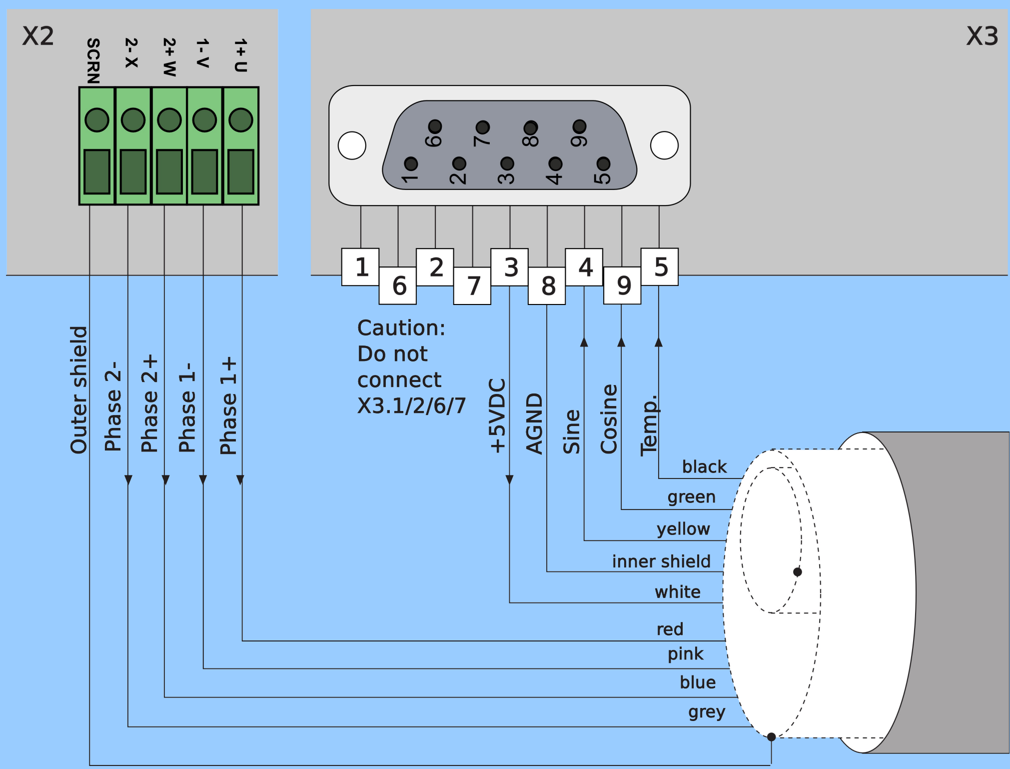


		LinMot Motor:		**3-phase EC-Motor:**
PH1+	/U	Motor Phase 1+	red	Motor Phase U
PH1-	/V	Motor Phase 1-	pink	Motor Phase V
PH2+	/W	Motor Phase 2+	blue	Motor Phase W
PH2-	/X	Motor Phase 2-	grey	Motor Phase X
SCRN		Shield		

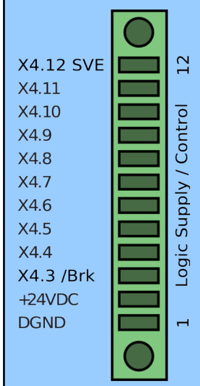
Screw Terminals

- Tightening torque: 0.5 - 0.6 Nm
- Screw thread: M2.5
- Use 60/75°C copper conductors only
- Conductor cross-section: 0.5 – 2.5mm^2 (depends on Motor current) / AWG 21 -14
- Stripping length 13-15mm

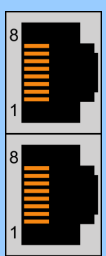
6.3 X3

X3	Motor Encoder		
		**LinMot Motor:**	**3-phase EC-Motor:**
	1	-	-
	2	-	-
	3	+5VDC	+5VDC (Hall Supply)
	4	Sensor Sine	Hall 1
	5	Temp. In	Hall 3
	6	-	-
	7	-	-
	8	AGND	AGND (Hall Supply)
	9	Sensor Cosine	Hall 2
	case	Shield	
DSUB-9 (f)	**Note**: Use +5VDC (X3.3) and AGND (X3.8) only for motor internal hall sensor supply (max. 100mA). **Caution**: Do NOT connect AGND (X3.8) to ground or earth!		
Motor Wiring			
			

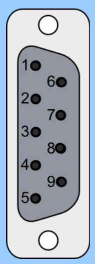
6.4 X4

X4	Logic Supply / Control		
	12 11 10 9 8 7 6 5 4 3 2 1	Input SVE I/O X4.11 I/O X4.10 I/O X4.9 I/O X4.8 I/O X4.7 I/O X4.6 I/O X4.5 I/O X4.4 I/O X4.3/Brk +24VDC Supply GND Supply	Power Stage Enable (HW Enable) Configurable IO, PTC2 Input Configurable IO, PTC1 Input Configurable IO Configurable IO Configurable IO, Analog Input for EasySteps Application Configurable IO, Trigger Input Configurable IO Configurable IO, Analog Input (configurable as high imp. Input) Configurable IO, Brake Driver 1A Logic Supply 22-26 VDC Ground
Phoenix MC1,5/12-STF-3,5	Inputs (X4.3 .. X4.12): 24V / 5mA (Low Level: –0.5 to 5VDC, High Level: 15 to 30VDC) Outputs (X4.4 .. X4.11): 24V / max.100mA, Peak 370mA (will shut down if exceeded) Brake Output (X4.3): 24V / max.1.0A Input X4.12: SVE (Safety Voltage Enable) must be high for enabling the power stage.). If it goes low for more than 0.5ms the PWM generation of the power stage is disabled by hardware. Supply 24V / typ. 400mA / max. 2.1A (if all outputs “on” with max. load.) - Tightening torque: min 0.22Nm - Screw thread: M2 - Use 60/75°C copper conductors only - Conductor cross-section max. 1.5mm^2 - Internal Fuse (F2): 3AT (slow blow, Schurter OMT125, 3404.0118.xx, UL File Number: E41599) **CAUTION:** For continued protection against risk of fire, replace only with same type and rating of fuse.		

6.5 X7 - X8

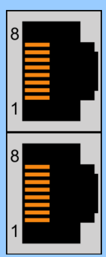
X7 - X8	RS485/CAN		
	1 2 3 4 5 6 7 8 case	RS485_Rx+ RS485_Rx- RS485_Tx+ GND GND RS485_Tx- CAN_H CAN_L Shield	A B Y Z
RJ-45	Use twisted pair (1-2, 3-6, 4-5, 7-8) cable for wiring. The built in CAN and RS485 terminations can be activated by S5.2 and S5.3. X7 is internally connected to X8 (1:1 connection)		

6.6 X9



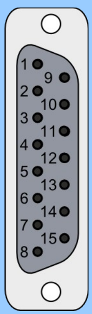
X9	PROFIBUS DP (only available on E1230-DP-UC)		
	1	Not connected	
	2	Not connected	
	3	RxD/TxD-P	
	4	CNTR-P	
	5	GND	(isolated)
	6	+5V	(isolated)
	7	Not connected	
	8	RxD/TxD-N	
	9	Not connected	
	case	Shield	
DSUB-9 (f)	Max. Baud rate: 12Mbaud		

6.7 X10 - X11

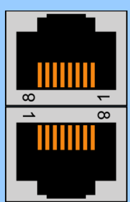


X10 - X11	Master Encoder IN (X10) / Master Encoder OUT (X11)			
		Incremental:	Step/Direction:	EIA/TIA 568A colors:
	1	A+	Step+	Green/White
	2	A-	Step-	Green
	3	B+	Direction+	Orange/White
	4	Z+	Zero+	Blue
	5	Z-	Zero-	Blue/White
	6	B-	Direction-	Orange
	7	CAN_H	CAN_H	Brown/White
	8	CAN_L	CAN_L	Brown
	case	Shield	Shield	
RJ-45	Use twisted pair (1-2, 3-6, 4-5, 7-8) cable for wiring. Master Encoder Inputs: Diff. RS422, max. counting frequency 25 Mcounts/s, quadrature evaluation, 40ns edge separation Master Encoder Outputs: Amplified RS422 differential signals from Master Encoder IN (X10) The CAN bus can be terminated with S5.4. All devices, which are connected to X10/X11 must be referenced to the same ground.			

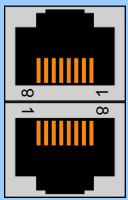
6.8 X13

X13	External Position Sensor Differential Hall Switches		/ SSI
		ABZ with Hall Switches	Sin/Cos 1Vpp with SSI
	1	+5V DC	+5V DC
	9	A+	Sin+
	2	A-	Sin-
	10	B+	Cos+
	3	B-	Cos-
	11	Z+	Data+
	4	Z-	Data-
	12	Encoder Alarm	Encoder Alarm
	5	GND	GND
	13	U+	
	6	U-	
	14	V+	
	7	V-	
	15	W+	Clock+
	8	W-	Clock-
	case	Shield	Shield
DSUB-15 (f)	Position Encoder Inputs (RS422): Max. counting frequency: 25 Mcounts/s with quadrature decoding, 40ns edge separation Encoder Simulation Outputs (RS422): Max Output Frequency: 2.5MHz, 5 M counts/s with quadrature decoding, 200ns edge separation Differential Hall Switch Inputs (RS422): Input Frequency: <1kHz Enc. Alarm In: 5V / 1mA Sensor Supply: 5VDC max 100mA		

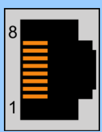
6.9 X15 - X16

X15 - X16	Config Ethernet 10/100 Mbit/s	
	X15 X16	Internal 2-Port 10BASE-T and 100BASE-TX Ethernet Switch with Auto MDIX. LEDs on the lower side of the device indicate "Link/Activity" per port, the upper ones are not used.
RJ-45		

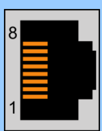
6.10 X17 - X18

X17 - X18	RealTime Ethernet 10/100 Mbit/s	
	X17 RT ETH In X18 RT ETH Out	Specification depends on RT-Bus Type. Please refer to according documentation.
RJ-45		

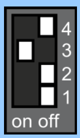
6.11 X19

X19	System	
	1 2 3 4 5 6 7 8 case	(Do not connect) (Do not connect) RS232 Rx GND GND RS232 Tx (Do not connect) (Do not connect) Shield
RJ-45	Use Adapter cable **AC01-RJ45/Df-2.5-RS1 (Art.-No. 0150-2143)** for Configuration over RS232.	

6.12 X20

X20	Analog In (+-10V Differential Analog Input)	
	1 2 3 4 5 6 7 8 case	(Do not connect) (Do not connect) Analog In - GND GND Analog In + (Do not connect) (Do not connect) Shield
RJ-45		

6.13 S5

S5	Bus Termination / AnaIn2 Pull Down	
	S5	Switch 1: AnIn2 Pull down (4k7 Pull down on X4.4). Set to ON, if X4.4 is used as digital Output. Switch 2: Termination Resistor for RS485 on CMD (120R between pin 1 and 2 on X7/X8) on/off Switch 3: CAN Termination on CMD (120R between pin 7 and 8 on X7/X8) on/off Switch 4: CAN Termination on ME (120R between pin 7 and 8 on X10/X11) on/off Factory setting: all switches “off”

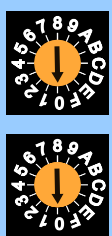
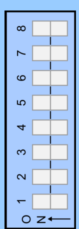
6.14 LEDs

LEDs	State Display	
Error  24VOK Warn EN	Green Yellow Yellow Red	24V Logic Supply OK Motor Enabled / Error Code Low Nibble Warning / Error Code High Nibble Error

6.15 RT BUS LEDs

RT Bus LEDs	RT Bus State Display	
	Green Red	OK Error
	The use of these LEDs depends on the type of fieldbus which is used. Please see the corresponding manual for further information.	

6.16 S1 - S2

S1 - S2	Address Selectors		
E12x0 V1	E12x0 V2		
		S1 (5..8) S2 (1..4)	Bus ID High (0 … F). Bit 5 is LSB, bit 8 MSB. Bus ID Low (0 … F). Bit 1 is LSB, bit 4 MSB.
The use of these switches depends on the type of fieldbus which is used. Please see the corresponding manual for further information.			

7 Error Codes

Error Codes			
			
Error	**Warn**	**EN**	**Description**
Off	Warning	Operation Enabled	**Normal Operation:** Warnings and operation enabled are displayed.
On	● ~2Hz 0..15 x Error Code High Nibble	● ~2Hz 0..15 x Error Code Low Nibble	**Error**: The error code is shown by a blink code with "WARN" and "EN". The error byte is divided into low and high nibble (= 4 bit). "WARN" and "EN" are blinking together. The error can be acknowledged. (e.g.: WARN blinks 3x, EN blinks 2x; Error Code = 32h)
● ~2Hz	● ~2Hz 0..15 x Error Code High Nibble	● ~2Hz 0..15 x Error Code Low Nibble	**Fatal Error**: The error code is shown by a blink code with "WARN" and "EN". The error byte is divided into low and high nibble. "WARN" and "EN" are blinking together. Fatal errors can only be acknowledged by a reset or power cycle. (e.g.: WARN blinks 3x, EN blinks 2x; Error Code = 32h)
● ~4Hz	● ~2Hz 0..15 x Error Code High Nibble	● ~2Hz 0..15 x Error Code Low Nibble	**System Error:** Please reinstall firmware or contact support.
● ~0.5Hz	● ~0.5Hz	On	**Signal Supply 24V too low:** The error and warn LEDs blink alternating if the signal supply +24V (X4.2) is less than 18VDC.
Off	✳●●●	●✳●●	**Plug&Play Communication Active** This sequence (Warn on, then En on, then both off, complete sequence of the 4 states ca. 1Sec) signalizes the state when the plug and play parameters are being read from the motor.

The meaning of the error codes can be found in the Usermanual_MotionCtrlSW_SG5 and the user manual of the installed interface software. These documents are provided together with LinMot-Talk configuration software and can be downloaded from *www.linmot.com*.

8 Physical Dimensions

E1200 Series *single axis drive*		
Width	mm (in)	40 (1.6)
Height	mm (in)	233 (9.2)
Height with fixings	mm (in)	270 (10.7)
Depth	mm (in)	180 (7.1)
Weight	kg (lb)	1.5 (3.3)
Case	IP	20
Storage Temperature	°C	-25…40
Transport Temperature	°C	-25…70
Operating Temperature	°C	0…40 at rated data 40...50 with power derating
Relative humidity		95% (non-condensing)
Max. Case Temperature	°C	65
Max. Power Dissipation	W	30
Clearance around drives	mm (in)	20 (0.8) left/right 50 (2) top / bottom

9 Power Supply Requirements

Motor Power Supply

The calculation of the needed power for the Motor supply is depending on the application and the used motor. The nominal supply voltage is 72- 80 VDC. The possible range is from 24 to 85VDC, for UL from 30 to 85 VDC.

ATTENTION: The motor supply can rise up to 95 VDC when braking. This means that everything connected to that power supply needs a voltage rating of 100 VDC. (Additional capacitors, etc…). Due to high braking voltage and sudden load variations of linear motor applications, **only specially designed power supplies can be used**.

Compatible Power supplies:

Item	Description	Art. No.
T01-72/420	72VDC, 15A peak, 420VA, 3x400VAC	0150-1966
T01-72/420-US	72VDC, 15A peak, 420VA, 3x230VAC	0150-1967
T01-72/900	72VDC, 30A peak, 900VA, 3x400VAC	0150-1842
T01-72/900-US	72VDC, 30A peak, 900VA, 3x230VAC	0150-1843
T01-72/1500	72VDC, 2x30A peak, 1500VA, 3x400VAC	0150-1844
T01-72/1500-US	72VDC, 2x30A peak, 1500VA, 3x230VAC	0150-1845
S01-72/500	72VDC, 500W, 750W peak, 1x100..120VAC/200..240VAC	0150-1874
S01-72/1000	72VDC, 1000W, 2000W peak, 3x380..500VAC	0150-1872

For compatibility with other power supplies, contact *support@linmot.com*

Signal Power Supply

The logic supply needs a regulated power supply of a nominal voltage of 24 VDC. The voltage must be between 22 and 26 VDC.

Current consumption:

min. 200mA (no load on the outputs)

typ. 1.1A (all 10 outputs “on” with 100mA load and /Break with no load)

max. 2.1A (all 10 outputs “on” with 100mA load and /Break with 1A load)

10 Regeneration of Power / Regeneration Resistor

There are two possibilities to deal with power regeneration:

Option A: Connect an additional capacitor to the motor power supply. It is recommended to use a capacitor >= 10’000 µF
(install capacitor close to the power supply!)

Option B: Install a regeneration resistor to X1 (RR+ and RR-). The threshold value of the voltage depends on the used motor voltage power supply. The max. threshold value must not exceed 88 VDC.

For UL applications, use option A.

Item	Description	Art. No.
Capacitor	Capacitor 10’000 µF / 100 V	0150-3075
Regeneration Resistor	R01-10/60 (10 Ohm, 60 W)	0150-3088
Regeneration Resistor	RR01-10/150 (10 Ohm, 150 W)	0150-3090

11 Ordering Information

Item	Description	Art. No.
E1250-PL-UC	POWERLINK Servo Drive 72VDC/32A	0150-1760
E1250-PN-UC	PROFINET Servo Drive 72VDC/32A	0150-1762
E1250-EC-UC	EtherCAT Servo Drive 72VDC/32A	0150-1763
E1250-SE-UC	sercos over EtherCAT Servo Drive 72VDC/32A	0150-1898
E1250-SC-UC	sercos Servo Drive 72VDC/32A	0150-1764
E1250-IP-UC	ETHERNET IP Servo Drive 72VDC/32A	0150-1761
E1230-DP-UC	PROFIBUS-DP Servo Drive 72VDC/32A	0150-1766
E1200-GP-UC	GENERAL PURPOSE Servo Drive 72VDC/32A	0150-1771
RS232 configuration cable	AC01-RJ45/Df-2.5-RS1	0150-2143

12 International Certifications

Certifications	
Europe CE	See chapter “14 Declaration of Conformity CE-Marking“

13 Classification of the safety functionality

Drives classification accordance with the new machinery directive EN ISO 13849-1: The safety function SVE (“Safety Voltage Enable”) on the LinMot drive series E1200, which is to provide the safe stop, fulfills the following criteria of the new machinery directive EN ISO 13849-1:

Category	cat	= 3
Performance Level	PL	= d
Diagnostic Coverage	CD	= medium
Mean time to hazardous failure of one channel	MTTFd	= 49.8 Years

14 Declaration of Conformity CE-Marking

Manufacturer: NTI AG *LinMot* ®
Haerdlistrasse 15
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Switzerland
Tel.: +41 (0)56 419 91 91
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Products: *LinMot* ® Drives

Type	Art.-No.	Type	Art-No.	Type	Art.-No.
E1250-PL-UC	0150-1760	E1250-EC-UC	0150-1763	E1200-GP-UC	0150-1771
E1250-IP-UC	0150-1761	E1250-SC-UC	0150-1764	E1250-SE-UC	0150-1898
E1250-PN-UC	0150-1762	E1230-DP-UC	0150-1766		

The product must be mounted and used in strict accordance with the installation instruction contained within the installation guide, a copy of which may be obtained from NTI Ltd.

I declare that as the authorized representative, the above information in relation to the supply/manufacture of this product is in conformity with the stated standards and other related documents in compliance with the protection requirements of the Electromagnetic Compatibility (EMC) Directive 2004/108/EC.

Standards Complied with:

EN 61000-6-2		Compliance Criteria	Immunity for industrial environment
	EN 61000-4-2	B	Electrostatic discharge immunity (ESD)
	EN 61000-4-3	A	Radiated electromagnetic field immunity
	EN 61000-4-4	B	Fast transients / burst immunity (EFT)
	EN 61000-4-5	B	Slow transients immunity (Surges)
	EN 61000-4-6	A	Conducted radio frequency immunity
	EN 61000-4-8	A	Power frequency magnetic field immunity
EN 61000-6-4		**Class**	**Emission for industrial environment**
	EN 55022	B	Radiated Emission

Company: NTI Ltd. / Spreitenbach / October 13, 2010



R. Rohner / CEO NTI AG

15 Contact Addresses

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		Tech. Support (Skype) :	skype:support.linmot
		Fax: **Web:**	+41-(0)56-419 91 92 http://www.linmot.com/
USA	**LinMot, Inc.** 204 E Morrissey Dr. Elkhorn, WI 53121		
		Sales and Administration:	877-546-3270 262-743-2555
		Tech. Support:	877-804-0718 262-743-1284
		Fax:	800-463-8708 262-723-6688
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Please visit http://www.linmot.com/ to find the distributor closest to you.

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